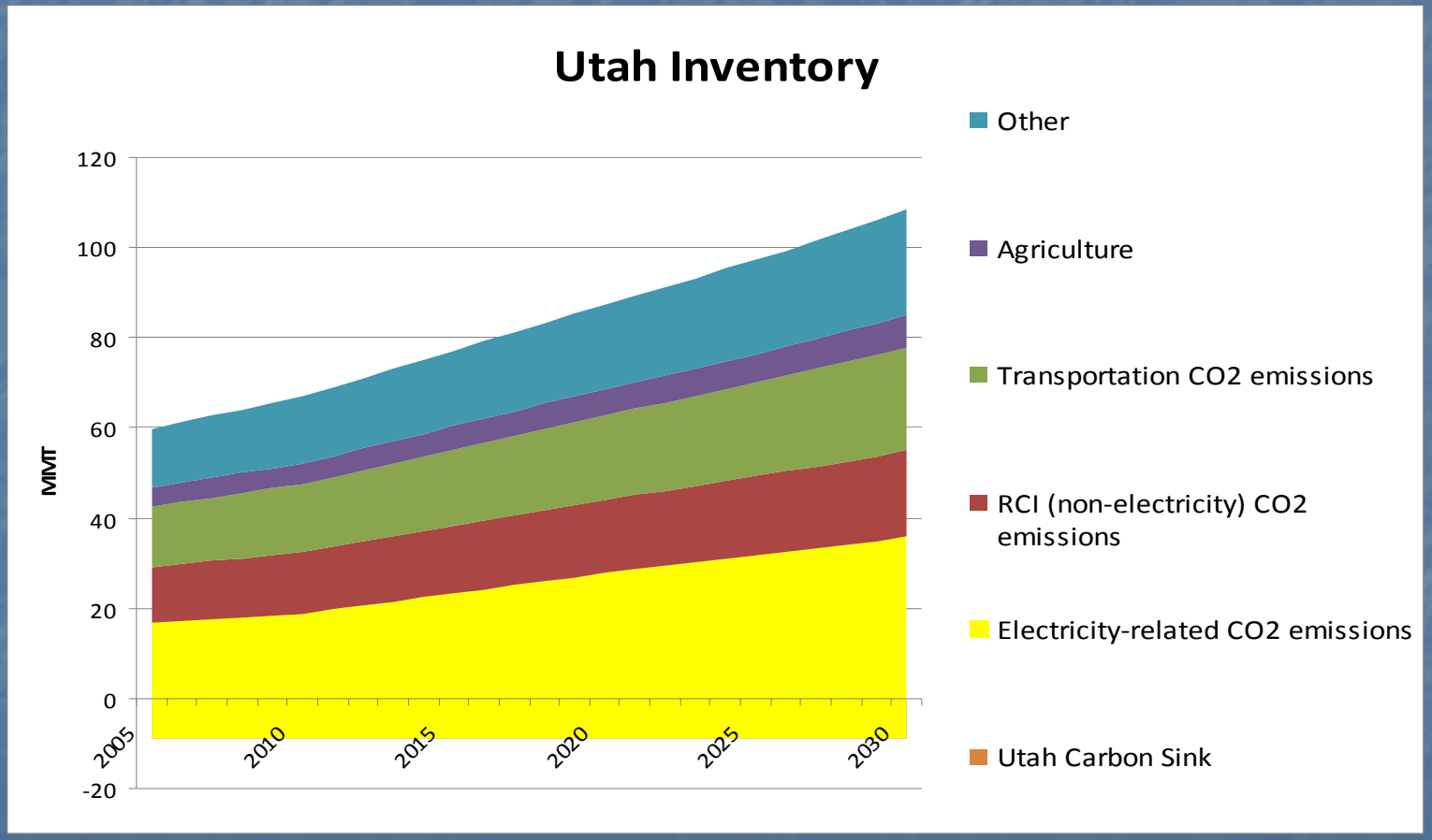
Utah Greenhouse Gas Study Follow up Briefing

June 2, 2008

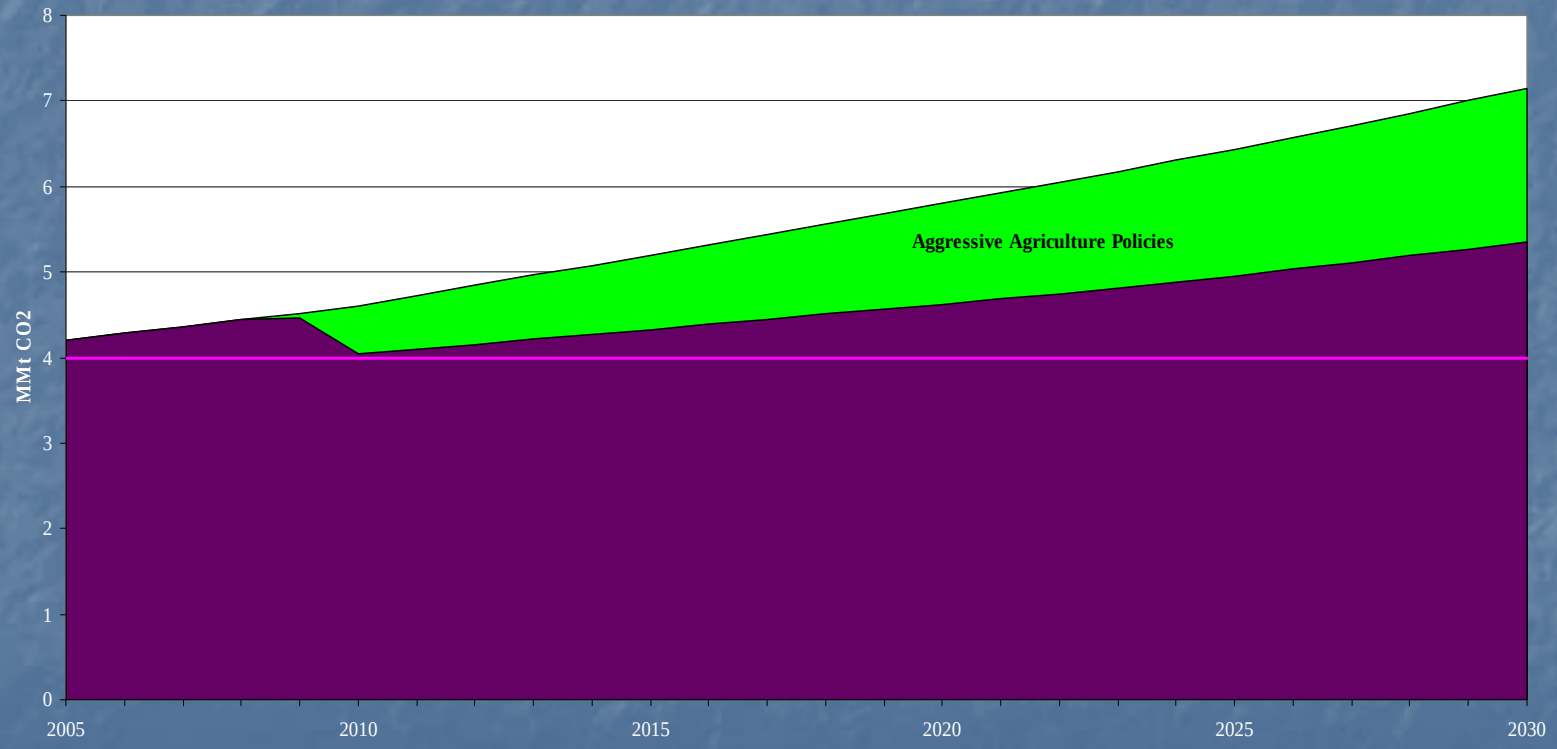
Etan Gumerman


Utah Inventory
MMT
120
100
80
60
40
20
0
-20
2005
2010
2015
2020
2025
2030
Other
Agriculture
Transportation CO2 emissions
RCI (non-electricity) CO2 emissions
Electricity-related CO2 emissions
Utah Carbon Sink

Baseline

- Reexamine?
- What is included in Baseline Inventory?

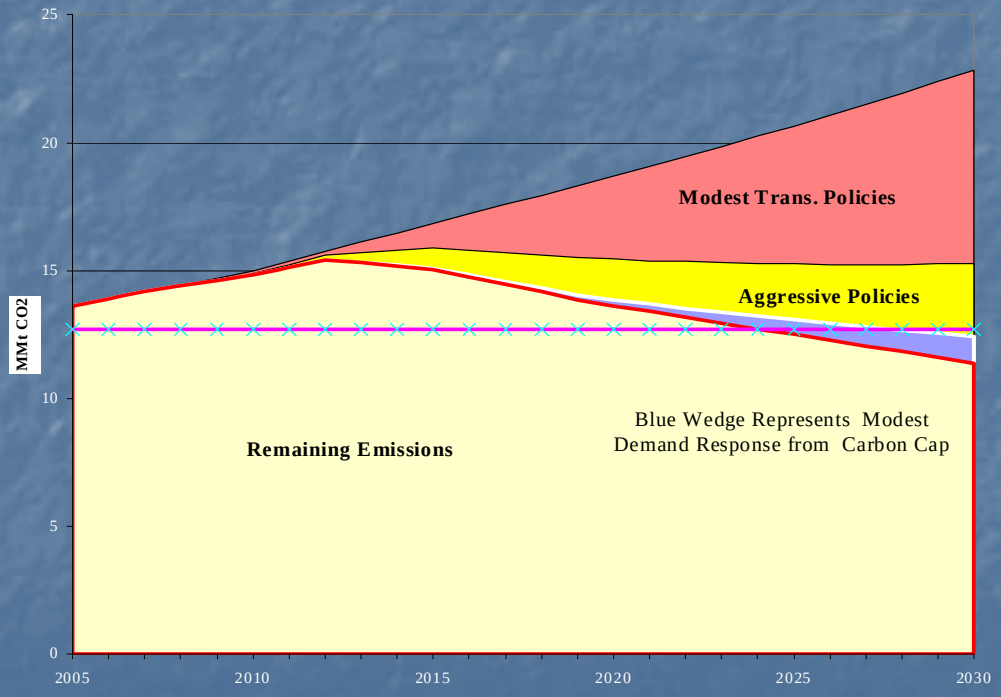
Agriculture Emissions



Assumptions: Production of Biomass Fuels

- Incentives to stimulate cellulosic ethanol production are initially $1.35 per gallon.
- Costs decline 15% per year starting in 2012 to account for technological change.
- Ethanol capacity grows at btw 7-10 Mgal through 2030
- Ethanol CO2e emissions assumed to be 72-88% lower than reformulated gas
- Sufficient feedstock available in Utah to produce >300 million gallons of ethanol
- Biodiesel production not large scale

Transportation Emissions



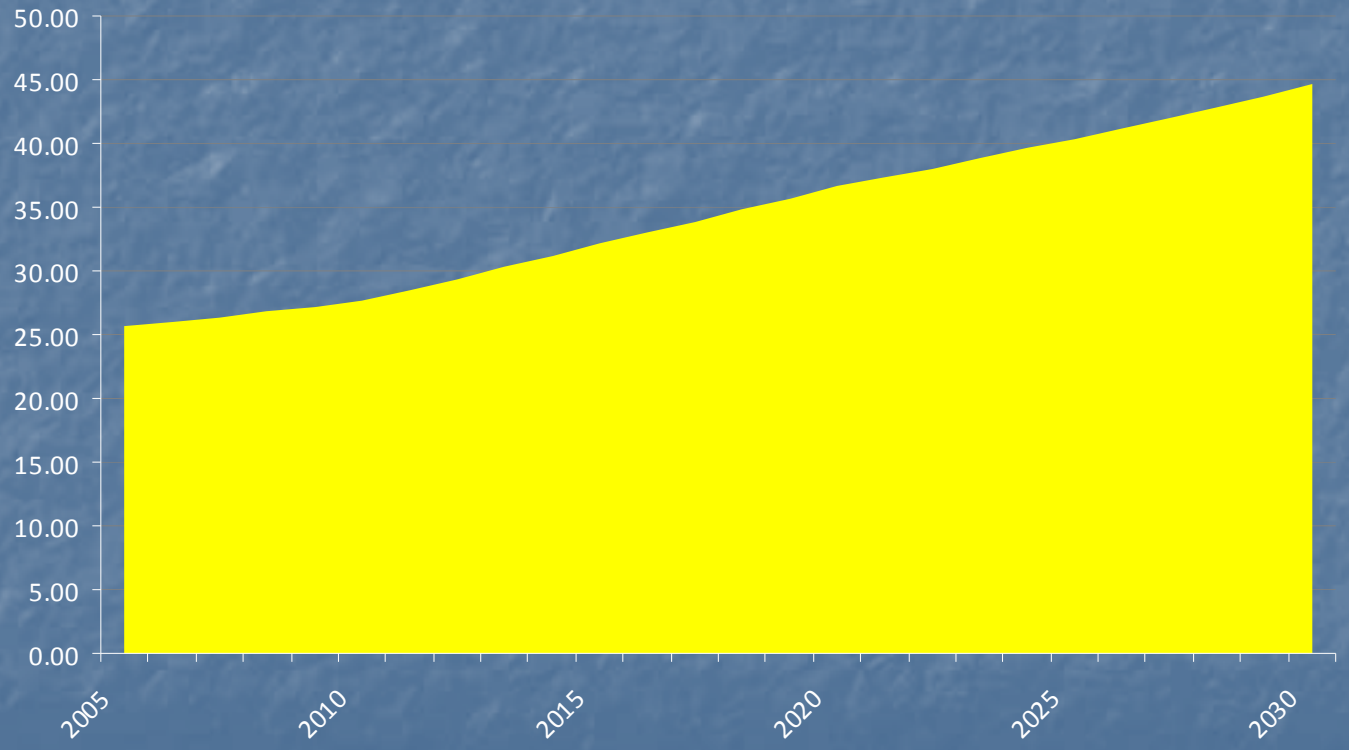
Assumptions: Clean Car

- Utah adopts California (Pavley) tailpipe standards
- Phase in 3 years after CA published schedule.
- Compared with reductions achieved from new CAFE standards in Energy Bill 2007

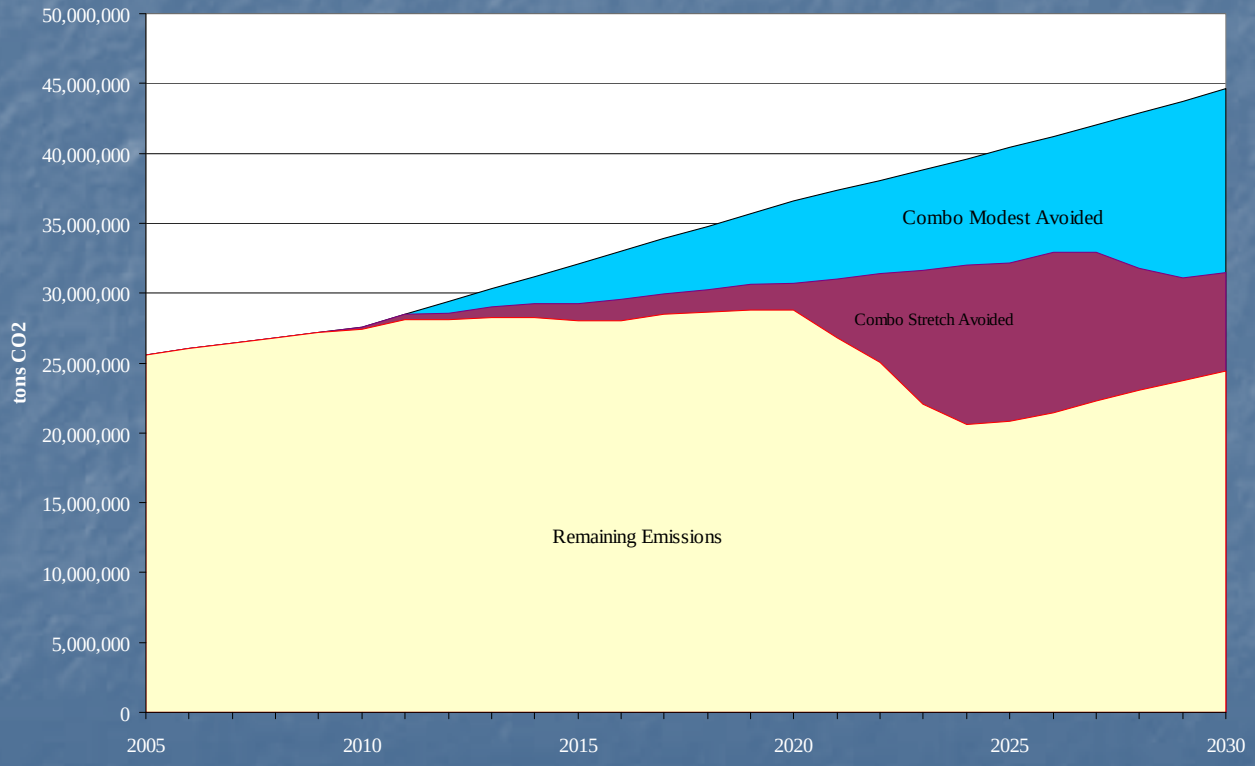
Assumptions: Aggressive Mass Transit

- 80% population VMT potentially affected
- Starts 2010, 2% of 80% VMT switches to MT
- Conservative scenario
  - Ramps up to 10% of 80% VMT switches to transit by 2030 half commuting, half non commuting
- Medium scenario
  - Ramps up to 21% by 2030
- Aggressive scenario:
  - 36% by 2030

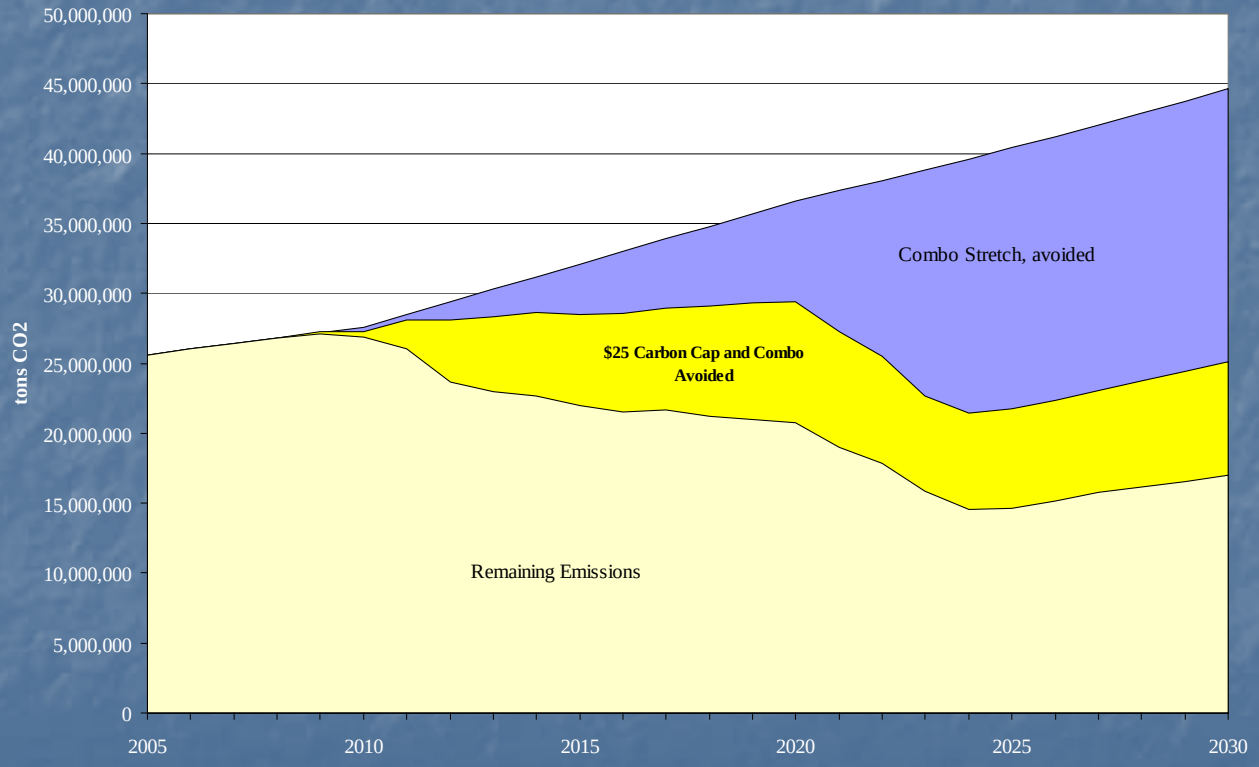
Electricity-related CO2 Emissions



Utah's Potential Avoided Emissions Range for Combined Set of Strategies



Potential Avoided Emissions Range for Stretch Combination Scenarios



RPS Modeling Assumptions

- Bramble Bill -- 20% renewable energy by 2025
- Build escalating amount of new capacity through 2025 in Utah, cumulative reaches 2.8 GW in 2025.
- Total WECC-wide scale this up by ~ 20 x, based on shares and existing and projected renewable shares.
- Combined Scenarios force less RPS capacity

Revised Carbon Capture and Sequestration Modeling Assumptions

- Replace existing coal plants with new CCS
- Carbon Capture and Sequestration embodies a lot of uncertainty
- For now, evaluate two CCS boundary conditions, but scenarios to follow

Range for CCS

First Revision of CCS Analysis (dollars are 2005$)

Stretch CCS

	How Much	When	Var O & M $ / MWh	Fixed O & M $ / MW / wk	Overnight costs $ / kW	HR
In Utah	2.5 GW	2022	$4.18	$736	$2,134	9713
Rest of WECC	15 GW	2021-2023	$4.18	$736	$2,134	9713

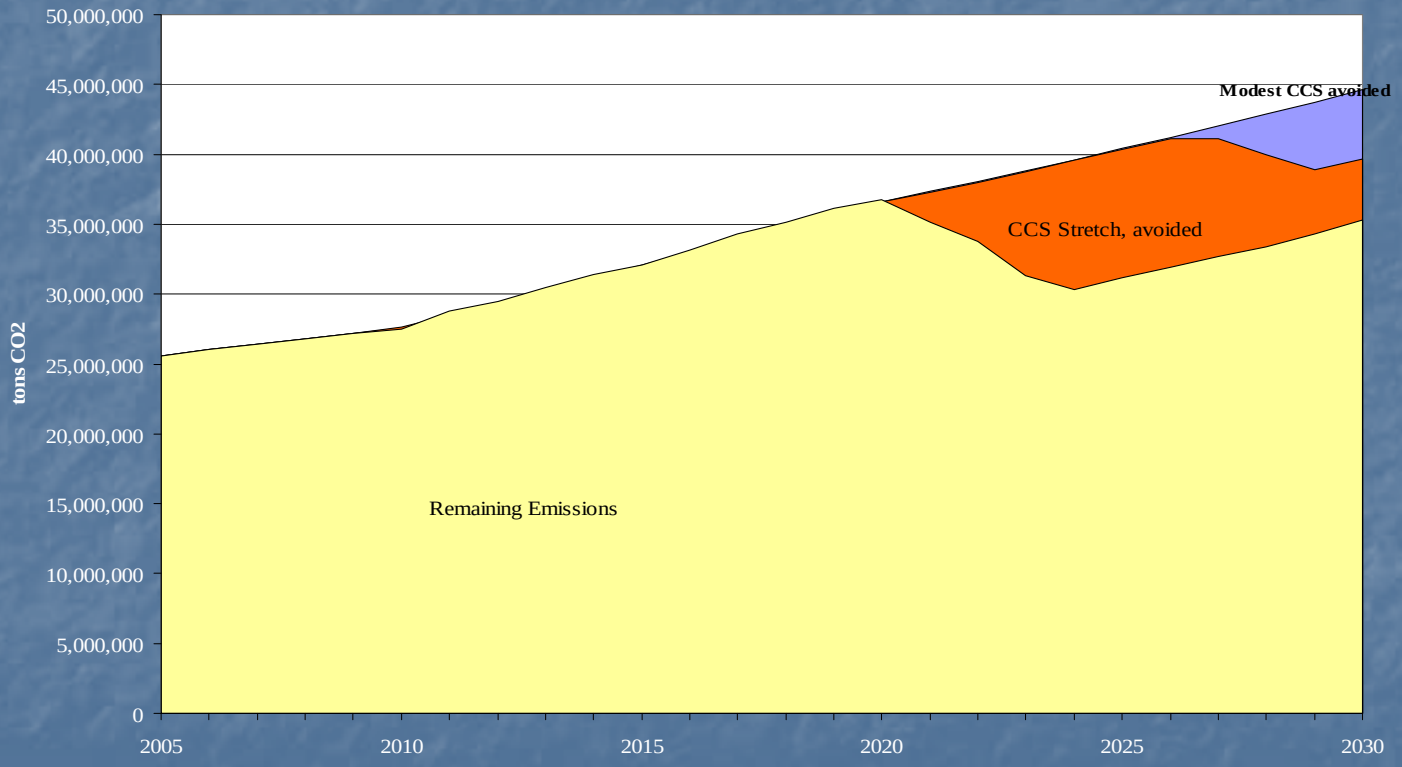
EIA costs from AEO 2007 Assumuptions

Modest CCS

In Utah	1.3 GW	2027-2029	$1.01	$897	$3,470	9713
Rest of WECC	7.2 GW	2027-2029	$1.01	$897	$3,470	9713

Specs from WCI assumptions for IGCC w/CCS high costs

Utah's Potential Avoided Emissions Range for CCS Options



Assumptions: Lighting Standards

- 11% of commercial and residential electricity used for lighting
- Federal standard requires 20% reduction in lighting-based energy use by 2012, 25% by 2013, 30% by 2014, and 60% by 2020

Demand Reduction Policies, DSM, Lighting Standards, Building Codes, and Incentives

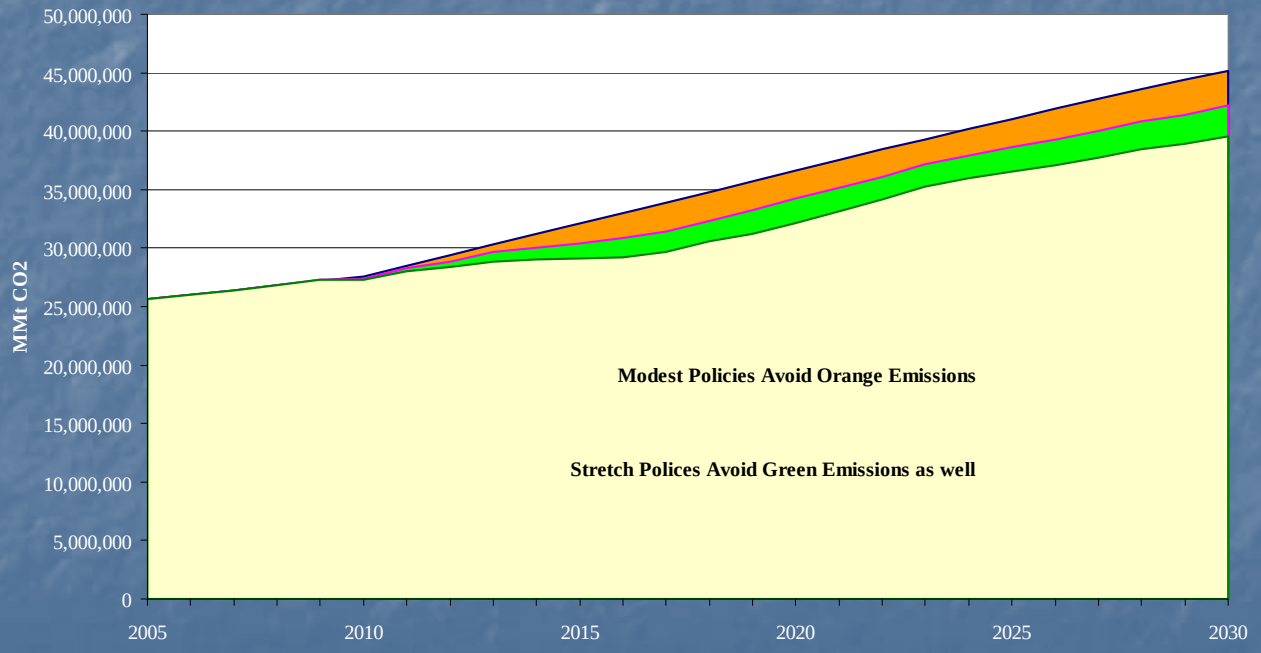
- By 2014, **new** policies achieve savings of 1% (modest) to 2% (stretch) of projected sales
- Cumulative electricity savings in 2020 are 6% (modest), and 11.5 (stretch)
- DSM type savings lifetime 7 Years
- Lighting share is almost equivalent to modest savings share

Demand Reductions Summary

In MWh	2010	2020	2030
Original Utah Baseline	30,584,652	42,435,035	51,782,038
Modest TOTAL	330,200	2,543,090	3,024,681
	1.1%	6.0%	5.8%
Stretch TOTAL	658,256	4,859,847	6,010,798
	2.2%	11.5%	11.6%

Saving are Cumulative

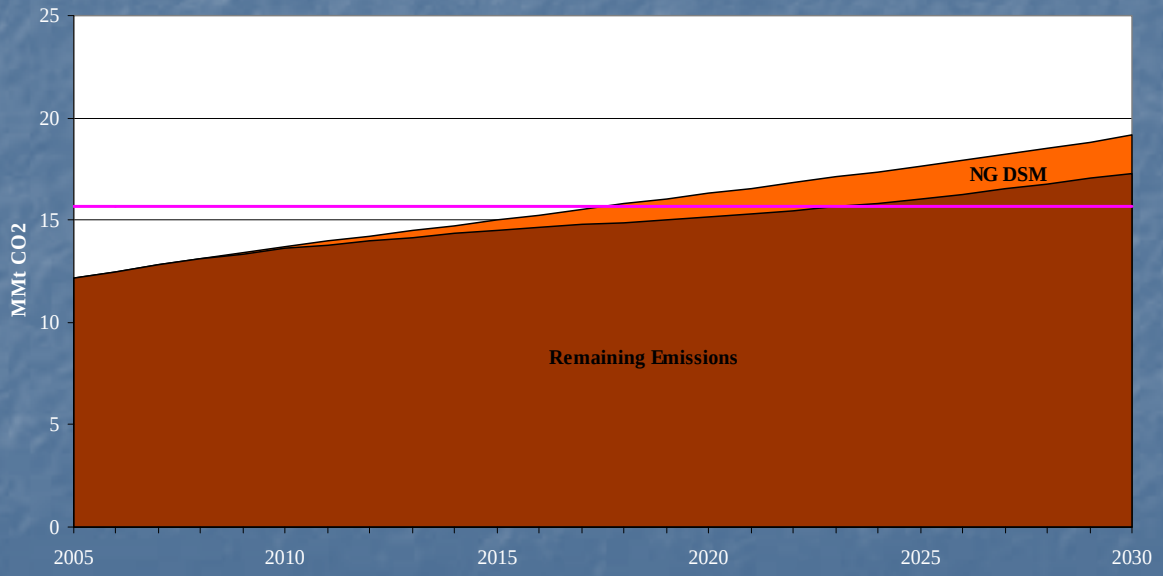
Demand Polices Avoided Emissions Potential



Carbon Cap Assumptions

- In Aurora Carbon Cap currently modeled as Carbon Price.
- For $25 Scenario, starting at $25 in 2012, escalating at 5% real per year.
- In 2020, this cap leads to $36.94, and $60.17 in 2030

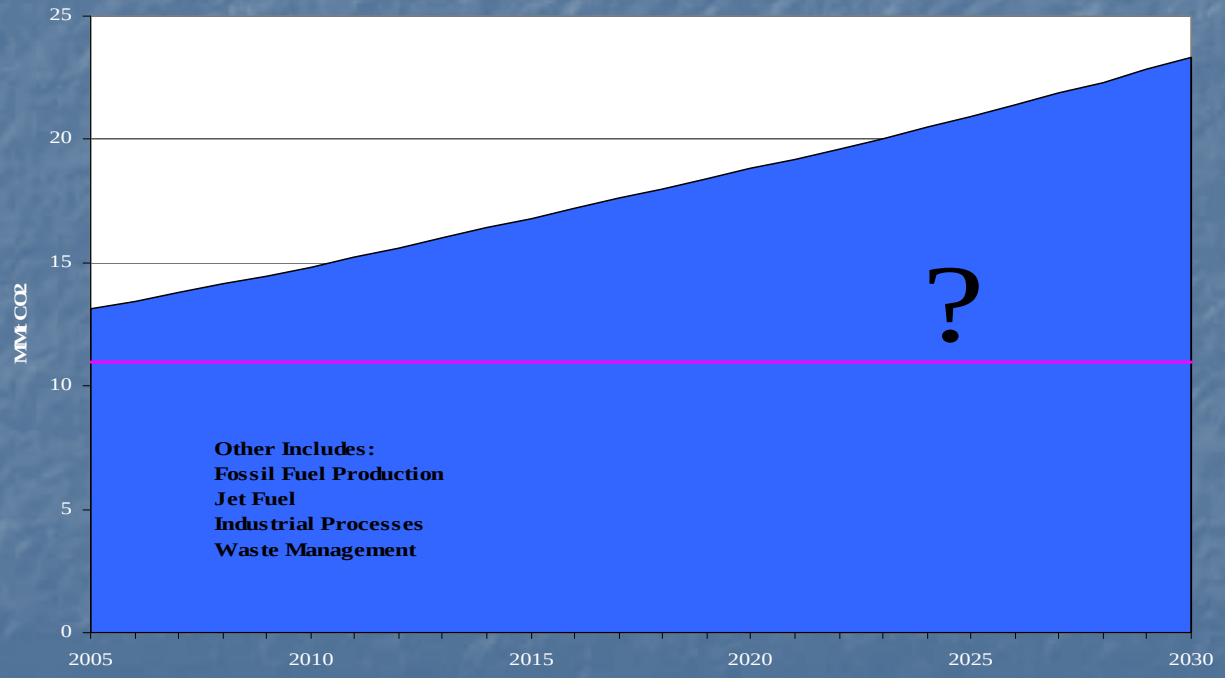
RCI Non-Electric Emissions



Other Emissions for Reduction Consideration

- Solid Waste
- Jet Fuel
- Cement and Lime Emissions

Other Emissions



Strategies in Progress or Identified for Additional Analysis

- Increase Fire Management
- Increase Forest Health
- Incentives for Geothermal Energy
- Landfill & Waste to Energy
- Continue Clean Car analysis
- Mass Transit
- Evaluating Electricity Price Effect of Strategies

Thank you!

Upcoming Analysis

- Macroeconomic Analysis using ADAGE model
- Applied Dynamic Analysis of Global Economy
- GDP, Employment, Output, Electricity ...